

**IN THE SPECIFICATION:**

Please replace the paragraph starting a line 13 of page 9 with the following paragraph:

B1  
LaPO<sub>4</sub> has many of the attributes that make the commonly used zirconia desirable as a thermal barrier material. LaPO<sub>4</sub> is refractory with low thermal conductivity (approximately 1.8 W/m·K at 700°C), high thermal expansion coefficient ( $9-10 \times 10^{-6}/K$ ), and low Young's modulus (133 GPa). Although stoichiometric LaPO<sub>4</sub> does not react with alumina (a favorable characteristic), it also does not bond effectively to alumina. As shown below, we altered the stoichiometry of the LaPO<sub>4</sub> or introduced interphase material to overcome this apparent shortcoming. LaPO<sub>4</sub> can be deposited in crystalline form on a heated substrate using conventional or pulsed electron beam vapor deposition and laser ablation, although those deposition techniques may not allow optimum control of coating composition. The deposition conditions used for electron beam vapor deposition can be adjusted to achieve a crystalline columnar microstructure, as in Fig. 1b, thereby mimicking the strain-tolerant microstructure of current state-of-the-art ZrO<sub>2</sub> coatings. LaPO<sub>4</sub> and closely related compounds are alternatives to ZrO<sub>2</sub> for thermal barrier coatings for metal alloy parts.

Please replace the paragraph starting a line 22 of page 13 with the following paragraph:

B2  
Figs. 1a and 1b shows that the coatings deposited at 860°C on rotated substrates were crystalline and exhibited a columnar shape similar to ZrO<sub>2</sub>-based thermal barrier coatings. The tips of the columns had mostly four-sided pyramidal shapes as shown in the surface portion of Fig. 1a. The coating appeared to grow first as a dense layer that subsequently developed into the columnar structure, with columns growing mostly vertically. This can be seen on the fracture face of Fig. 1a. The columns exhibited also a feather-like microstructure that is thought to decrease thermal conductivity which structure can be seen more clearly in Fig. 1b.

Please replace the two paragraphs starting a line <sup>13</sup>~~22~~ of page <sup>14</sup>~~43~~ with the following paragraphs:

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The microstructures of the coatings deposited by laser ablation did not exactly match those obtained by EB-PVD at the same deposition temperatures. At low temperature, the coatings were poorly crystallized and often exhibited a well-defined columnar microstructure, which can be seen in Fig. 2a. At 740°C ( $\sim 0.43T_M$ ), the coating was relatively dense and the X-ray diffraction pattern was similar to that of EB-PVD coatings deposited at low temperature

B3 We defined deposition conditions under which crystalline columnar coatings were obtained (similar to Fig. 1b), with structures similar to EB-PVD ZrO<sub>2</sub> coatings known to have high strain tolerance. However, some difficulty was encountered in controlling the composition, specifically the La:P ratio, during deposition of such thick coatings. The difficulty in controlling composition is intrinsic to the deposition methods used, which involved melting and evaporation. Monazite is a line compound that melts congruently. In addition, La<sub>2</sub>O<sub>3</sub> and P<sub>2</sub>O<sub>5</sub> have very different melting points (*i.e.*, 2070°C and 540°C, respectively) and their thermal decomposition leads to species having very different partial pressures above their respective oxides at a given temperature. At sufficiently high temperature, the evaporation of LaO(g) and PO<sub>2</sub>(g) species from solid stoichiometric LaPO<sub>4</sub> would be expected to occur simultaneously. Remedies to this issue are well identified in the art of coating. Complementary techniques using EB-PV deposition include the use of multiple crucibles, off-stoichiometry targets or assistance of gaseous jet to collimate the vapor. In the case of plasma-sprayed coatings, laser or pulsed electron beam ablation, off-stoichiometry target compositions would address this issue.

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